

REMARKS

Applicants have received and reviewed the Office Action dated June 10, 2009. By way of response, Applicants have added claims 18-23 and present the following remarks. No new matter has been added. Claims 1-11 and 17-23 are pending.

Applicants submit that the amended and newly presented claims are supported by the specification as filed. For example, claims 19-23 are supported throughout the specification as filed including at least at page 4, lines 21-33. Claim 18 includes a recitation formerly found in claim 5.

For the reasons presented below, Applicants respectfully submit that the amended and newly presented claims are in condition for allowance, and notification to that effect is earnestly solicited.

Rejection of Claims Under 35 U.S.C. § 112, Second Paragraph

The Examiner rejected claim 5 under 35 U.S.C. § 112, second paragraph. The Examiner objected to the term “preferably” in this claim. The recitation that followed the term “preferably” in claim 5 is now presented in claim 18.

Accordingly, the amended claims fully comply with § 112, second paragraph, and withdrawal of this rejection is earnestly solicited.

Rejection of Claims Under 35 U.S.C. § 103(a)

The Examiner rejected claims 1-11 and 17 under 35 U.S.C. § 103(a) as obvious over Borke et al., US 2005/0049343 in view of Swarbrick et al., US 4,117,195. The Examiner rejected claims 1-3, 5-11 and 17 under 35 U.S.C. § 103(a) as obvious over Keogh, US 4,707,520 in view of Swarbrick et al. Although these rejections have not been applied to the newly presented claims, they are discussed insofar as they might apply. Applicants respectfully traverse these rejections.

The presently claimed invention provides a pipe with unexpectedly advantageous pressure resistance. For example, in embodiments, the pressure resistance at 95 °C can exceed 2.8 MPa, can exceed 3.6 MPa, and can even exceed 4.4 MPa with a failure time of at least 1000

hours (page 4, lines 21-33). This is achieved by a composition including a silane copolymer having an advantageously high density (e.g., $>925 \text{ kg/m}^3$) that can also have an advantageously low content of HDPE ($<40 \text{ wt-\%}$). Claims 11 and 19-23 recite the unexpectedly advantageous pressure resistance.

By the Standard Set in the MPEP at 2144.05, The Combined Borke et al. and Swarbrick et al. References Fail to Render the Presently Claimed Invention Obvious

The Borke et al. reference discloses a composition suitable for application to wire or cable as an insulation that can include "a weight ratio from 4:1 to 1:4 (bimodal HDPE:silane copolymer)" (paragraph 19). The Borke et al. reference also discloses a 1:1 mixture of an HDPE with a silane copolymer of density 0.9225 g/cm^3 (paragraph 60), which is a density of 922.5 kg/m^3 . Pressure resistance that prevents bursting is irrelevant to insulation for a wire or cable because the wire or cable exerts no pressure on the insulation. Hence, the Borke et al. reference is silent with respect to varying the composition of its insulation to achieve pressure resistance.

The Swarbrick et al. reference discloses that a composition such as that disclosed by Borke et al. can be extruded to form pipe. The Swarbrick et al. reference is also silent regarding varying a composition to achieve pressure resistance.

To render the presently claimed invention obvious, the cited references must recognize the way in which the composition is varied to provide the pressure resistance (the result-effective variable). MPEP at 2144.05.II.B and 2144.05.III. Result effective variables for the presently claimed invention include the density of the silane copolymer and the amount of HDPE in the composition. The cited references, either alone or in combination, fail to recognize these result effective variables. Accordingly, by the standard set forth in the MPEP at 2144.05.II.B and 2144.05.III, the cited Borke and Swarbrick references fail to render the presently claimed invention obvious.

The density of silane copolymer disclosed by the Borke et al. reference is less than the density recited in claim 1. The Borke et al. reference fails to recognize that increasing the density of the silane copolymer would achieve unexpectedly increased pressure resistance. The Borke et al. reference favors amounts of HDPE equal to or in excess of the amount of silane

copolymer. This is because the HDPE is responsible for the beneficial qualities of the insulation disclosed by the Borke et al. reference. The Borke et al. reference fails to recognize that decreasing the amount of HDPE would achieve unexpectedly increased pressure resistance. The Swarbrick et al. reference does not remedy these shortcomings of the primary Borke et al. reference. Thus, these combined references fail to teach or suggest the presently claimed invention. MPEP 2144.05.II.B and 2144.05.III.

Furthermore, the examiner argued that the polymer of example 1 of the Borke et al. reference, which has a density of 0.9225 g/cm^3 and a vinyl-trimethoxysilane (VTMOS) content of 1.7 %, would have a density of $>0.925 \text{ g/cm}^3$ when lowering the VTMOS content to 0.25 wt.%. Such an argumentation is based on a hindsight view as no suggestion is given in the Borke et al. reference to seek the density of the ethylene silane copolymer as required by claim 1 of the present application.

By the Standard Set in the MPEP at 2144.05, The Combined Keogh and Swarbrick et al. References Fail to Render the Presently Claimed Invention Obvious

The Keogh reference discloses a composition suitable for application to wire or cable as an insulation that can include silane monomers. The Keogh reference discloses that the composition can also include alkylene-alkyl copolymers with a density of about 0.92 to 0.94 (column 4, lines 36-40). The Office Action appears to indicate that this density is stated for a silane copolymer, but this density is stated for an alkylene-alkyl copolymer without mention of a silane component (column 4, lines 36-60). Thus, the Keogh reference is silent about the density of any ethylene silane copolymer resin, which is a feature recited in claim 1.

Pressure resistance that prevents bursting is irrelevant to insulation for a wire or cable because the wire or cable exerts no pressure on the insulation. Hence, the Keogh reference is also silent with respect to varying the composition of its insulation to achieve pressure resistance.

The Swarbrick et al. reference discloses that a composition such as that disclosed by the Keogh reference can be extruded to form pipe. The Swarbrick et al. reference is also silent about the density of any ethylene silane copolymer resin and varying a composition to achieve pressure resistance.

To render the presently claimed invention obvious, the cited references must recognize the way in which the composition is varied to provide the pressure resistance (the result-effective variable). MPEP at 2144.05.II.B and 2144.05.III. Result effective variables for the presently claimed invention include the density of the ethylene silane copolymer and the amount of HDPE in the composition. The cited references, either alone or in combination, fail to recognize these result effective variables. The cited references, in fact, are silent regarding the density of any ethylene silane copolymer resin, varying a composition to achieve pressure resistance, and pressure resistance.

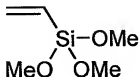
Accordingly, by the standard set forth in the MPEP at 2144.05.II.B and 2144.05.III, the cited Keogh and Swarbrick references fail to render the presently claimed invention obvious.

Additional Differences

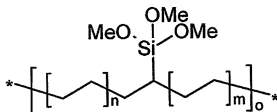
To further explain the ways in which the resins disclosed in the cited references are not like the claimed pipe, as alleged by the Examiner, Applicants would like to explain the differences between silane-grafted polyethylene and polymers obtained by copolymerizing ethylene and silane monomer units with reference. This explanation is offered with reference to the article from the technical literature accompanying this Amendment and Response as Exhibit A.

In a grafting process, an ethylene polymer which does not contain any silane groups is treated with a silane containing compound, e.g. vinyl-trimethoxysilane (VTMOS), and a grafting agent (usually a peroxide). In a copolymerization process of ethylene and silane group containing monomer units (which can be VTMOS as used above), are copolymerized into a polymer chain. Although VTMOS can be used in both processes the resulting polymers differ in their chemical structure as follows.

VTMOS is represented by the following formula:

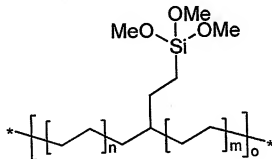


When copolymerizing VTMOs and ethylene the following general structure of the following polymer structure results:



Hence, the carbon-carbon double bond of the VTMOs becomes part of the polymer chain and, as a result, the silicon atom is directly bound to a carbon atom of the polymer chain. This is also shown in Exhibit A, p. 70, Fig. 9 lower right corner.

In a grafting process usually the CH₂-carbon atom of the carbon-carbon double bond is attached to the polymer chain resulting in the following general structure:



Hence, the carbon-carbon double bond of the silane group containing compound is not incorporated into the polymer main chain but is attached thereto. This is also shown in Exhibit A, p. 70, Fig. 7 lower right corner.

Thus, polymers obtained by copolymerization and by grafting are structurally different.

Furthermore, as shown by figure 7 on page 70 of Exhibit A, a grafting process starts with the removal of a hydrogen radical from the polymer chain by the grafting agent, usually a peroxide. The carbon centered radical on the polymer chain reacts with the carbon-carbon double bond of the silane compound to be grafted. Thereby, a radical is formed on the carbon atom attached to the silicon atom. This radical can

remove a further hydrogen atom from the polymer chain and thus, continue the grafting reaction, but can also undergo an undesired side reaction (Exhibit A, p. 69, right column 2nd paragraph).

Kindly note that in a grafting process the choice of antioxidants (which are radical scavengers) is limited for the following reasons. In a grafting reaction the polymer is heated to the temperature whereupon the grafting agent forms radicals. At such a temperature thermal degradation of the polymer would occur in case no antioxidant is present. Therefore, an antioxidant has to be present during the grafting reaction. However, it has to be chosen such that the polymer is protected from thermal degradation but the grafting process is not negatively affect (Exhibit A, p. 69, right column, 2nd paragraph). Usually aromatic amines are used whereby an undesirable yellowish color of the polymer results. Nevertheless, even with due care in a grafting process side reactions occur, e.g. chain scission, i.e. polymer chains are cut by the peroxide, and volatile low molecular weight products (alcohols, aldehydes etc.) form.

In case ethylene is copolymerized with a silane-containing monomer limitations of the antioxidant do not apply as can be seen from Exhibit A, p. 70, left column 3rd paragraph to right column first paragraph. Hence, the antioxidant can be freely chosen as no grafting agent is required.

Furthermore, the silane monomer is more evenly distributed compared with grafting as the radical on the carbon atom bound to silicon (cf. Exhibit A, p. 70, Fig. 7, lower right corner) can only react with molecules in its vicinity. Hence, provided that the radical is not consumed in a side reaction as mentioned above, hydrogen radical abstraction on the polymer chain predominantly occurs close to the silane group which is detrimental to an even distribution of the silane grafted compound.

Due to the more even distribution of the silane compound in ethylene silane copolymers, lesser silane units compared with a grafted polymer are required to achieve the same degree of cross-linking.

Additional advantages of a copolymerization process include:

- a) unreacted monomers can be recovered, whereby in a grafting process this is

not feasible as the silane monomer to be grafted is mixed with remnants from the peroxide and volatile decomposition products;

- b) no undesired side reactions can occur;
- c) no void formation occurs due to the absence of grafting agent (peroxide)

Thus the phrase "crosslinkable high-pressure ethylene silane copolymer" unambiguously denotes a polymer obtained by copolymerizing ethylene and silane monomer units. This is further supported by Exhibit A, p. 70, left column, 1st paragraph of item "General" wherein it is clearly stated that the vinylsilane monomer is added to the high pressure reactor.

Thus, the cited references neither disclose nor suggest the presently claimed invention.

Conclusion

Accordingly, based on the foregoing differences, Applicants submit that the cited references neither teach nor suggest the presently claimed pipe, and withdrawal of these rejections is earnestly solicited.

Summary

In view of the above amendments and remarks, Applicant respectfully requests a Notice of Allowance. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

Reply to Office Action of 06/10/2009


Please consider this a PETITION FOR EXTENSION OF TIME for a sufficient number of months to enter these papers or any future reply, if appropriate.

Please charge any additional fees or credit any overpayment to Deposit Account No. 13-2725.

Respectfully submitted,

MERCHANT & GOULD P.C.
P.O. Box 2903
Minneapolis, Minnesota 55402-0903
(612) 332-5300

Date: 12 Oct '09


Mark T. Skoog
Reg. No. 40,178

MTS:kf

